The Madras Agricultural Journal.

(ORGAN OF THE M. A. S. UNION)

Vol. XXIX] DECEMBER 1941 [No. 12.

EDITORIAL

Geography and its relation to Agriculture. Today, owing to the tremendous progress made in the methods of quick transport and communication by land, water and air, no part of the world is isolated from the rest. The reality of the modern world as a living unit has been brought to the minds of thinking men and women. The meat production in Argentine or dairy-farming in New Zealand influences the cost of living in countries far distant; the failure of Indian monsoon, the unsettled political affairs in China, India or Russia may hamper industrial progress in Lancashire and in this way any incident of abnormal nature happening in any part of the world has its repercussions on the rest of the world. Every biologist knows that in the case of a living microscopic or macroscopic, animal or plant, that this is very true, namely, that the affection of a part, however slight it may be, upsets the whole. So is it in the case of the world unit. One of the aims of education is to impart a very liberal outlook, broad culture and a sound training for citizenship.

A very sound and thorough knowledge of the geography of the world, especially of countries which are agriculturally or industrially important is very essential to a student of Agriculture. In fact, it is best he is given a course in the subject, not from the examination point of view but for enabling him to understand and follow easily such important matters as the centres of origin of many of our cultivated plants, the geographical distribution of crops in relation to the world at large and to particular provinces of one's own country, the soils and climatological conditions which play an important part and determine the distribution of crops, the large markets of the world for agricultural and industrial commodities, the up-to-date routes by land, water and air which connect up the different parts of the world and a host of other economic problems of modern times, which are dealt with in a College of Agriculture. However well the professor may deal with the subjects just enumerated above, with world maps and epidiascope to help him, unless and until the student attending the lecture has the geographical picture clear in his mind's eye, it will be very difficult for him to derive the full benefit of the lecture.

The Bullock Cart. The reading public might have noticed the publication of a very interesting and thought provoking article entitled "The Economics of the Bullock cart" by A. Nageswara Ayyar, Retired Special Engineer to the Government of Madras, Road Development, in the Sunday Supplement of "the Hindu" of 16th November 1941. The bullock cart is one of the ancient but a most necessary item for every agriculturist. The author, an expert in the subject, has pointed out the defects in the construction of the bullock carts of today and suggests methods of improvement

which are within easy reach of an ordinary farmer. Discussing the subject of wear on roads, he states "That due to vehicles with pneumatic tyre equipment is the least " and adds " the cost of fitting pneumatic tyre equipment is very high and judging by the absence of enthusiasm on the part of the ordinary cart owner to fit it to his vehicle shows that the cost is beyond his capacity. In the case of the agricultural carts whose number is by far the largest in the province, they use the roads only in the non-agricultural season and even then a considerable part of their travel is over earth and village roads. The carts lie idle for a large part of the year. Pneumatic tyres for them will be very uneconomical as the rubber will perish by exposure even when the vehicles are not in use. If pneumatic tyred vehicles have to be brought to general use they can be done so only if Government or Local bodies subsidised the equipment manufacturers so that cart owners will be in a position to change over without considerable extra cost. This subsidy will not end with the initial change over but will have to be continued for every tyre renewal. The number of vehicles will run into several lakhs for the whole province. The subsidy will be very costly and as the damage to the road caused by lorries, buses and other motor vehicles will still remain as at present, it looks as though the cost of repairing the extra damage done to the road by the present bullock carts will be considerably less than what the subsidy will cost. Without such subsidy it is very doubtful if pneumatic tyred bullock carts will come into general use in any measurable length of time. Municipalities, Local Boards and big companies can no doubt be made to effect the change but this will be only a drop in the ocean and will make no appreciable difference in the road maintenance cost". To get over the problem of the wear on the road and to improve the cost in general it is suggested that the cart be fitted with well turned axles and hubs and arrangement be made for efficient lubrication and to quote his own words " What is urgently required is (1) the design of a good hub and axle capable of efficient lubrication without waste, and standardising it (2) making arrangements with local manufacturers to produce them in large scales and make them available to the cart owners at a price (to be fixed by Government) not much in excess of what the cartmen now have to pay. Yet another very important point suggested for our consideration is the widening of the tyres. It is pointed out that the prevalent feeling, that increase of tyre width would mean increase in weight of the wheels and their cost, is erroneous. The engineer says that widening of the rims can be effected by making them less deep and that by a judicious arrangement of the spokes the weight of the wheels can be kept the same as at present and yet made to give the present strength and service and as an example he cites the military carts which carry loads in no way less than the country carts but have only light wheels. It is, therefore, emphasized that what is urgently wanted is the design of standard wheel which will have a tyre width of 3 inches and will be as light and strong as the existing wheels.

Samai—The Little Millet—*Panicum miliare*, Lamk.

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Origin. Very little literature is available regarding the place of origin of *Samai*. De Candolle (1884) does not make any reference to this crop in his "Origin of Cultivated Plants". According to Blatter and McCann (1935) "the crop is cultivated or naturalised throughout India and Ceylon; cultivated in the Tropics". Chevalier (1922) mentions that this species is cultivated only in British India and Ceylon, and perhaps also in Central China.

The fact that it has a name in almost all languages of India, and that its wild ancestor *P. psilopodium* is found abundantly in India, Burma and the Malay Peninsula, indicates that *Samai* was first brought into cultivation in India.

Distribution. *Samai* is grown to a limited extent in almost all the provinces of India. Its cultivation extends upto an elevation of 7,000 feet or more. It is found wild (probably escaped from cultivation) in the Punjab, Burma and South-Eastern Asia. It has very little importance outside India except probably in Ceylon where it is cultivated to a small extent. It has been tried, though not with much success, in the Straits Settlements and the Federated States of Malaya. The crop has also been tried on an experimental basis in many parts of Africa by the European settlers; but its cultivation there is unimportant (Sampson, 1936).

Botanical description. The description of *Samai* has been given by Hooker (1875), Gamble (1934), and Blatter and McCann (1935). Brief descriptions are also found in many books dealing with grasses. A comprehensive description based on the above authors is given below.

Panicum miliare, Lamk., belongs to the tribe *Paniceae* under Gramineae. Its specific name, *miliare*, is derived from the old latin *milium* meaning millet. An annual grass, with culms 30—90 cm. high, rather slender, erect or base geniculate, simple or branched; *leaves* linear 15 to 50 cm. or more in length, 12 to 25 mm. broad, gradually tapering from a broad base, glabrous or finely hairy; *Sheath*—rarely hairy with tubercled—based hairs; *Ligule*—a narrow row of hairs; *Node*—glabrous; *Panicle*—very compound, contracted or thyrsiform, often nodding, 15 to 45 cm. long; *Spikelet*—glabrous, rather flattened, suddenly cuspidate, 3—4·5 mm. long, mostly paired on unequal pedicels, but often solitary at the end of the branchlets, lanceolate in flower, elliptic or broadly elliptic in fruit. *Glume I.* Very broadly ovate, subtruncate, then suddenly acute, or scarcely acute, about

* Paper read before the meeting of the Association of Economic Biologists, Coimbatore on December 20, 1940.

1/3 the spikelet, white, membranous, 3—5 nerved, nerves arching and anastomosing. *Glume II.* Herbaceous ovate lanceolate, 11—13 nerved, almost as long as the spikelet. *Glume III.* Herbaceous, broadly ovate, 9 nerved, slightly shorter than *Glume II*, palea as long as the Glume (3—4 mm.), flower neuter or rarely with 3 stamens. *Glume IV.* Narrow elliptic, or elliptic-oblong to broadly ovate, acute, shining white or pale brown or dark brown, often 3—5 streaked dorsally; *Fruit* Caryopsis enclosed tightly within the fourth glume and its palea (2·5 to 3·5 mm.).

Note. Some of the samples of *Samai* collected from the Agency tracts of Ganjam and Vizagapatam are much taller (100—150 cm.) and later (120—140 days) than the types from other parts of the Presidency. These do not tiller so profusely as the short duration varieties, there being only 3—5 tillers, with each tiller bearing a good-sized head. The culm is stout, about 10—15 mm. in diameter and the leaves are proportionately large. The varieties maturing in 70—90 days are shorter in height, (30—70 cm.), tillering profusely, (upto 25 tillers), especially under irrigation. Secondary branching is quite common in these varieties. The main axis of the panicle is nodding especially after the grain has set.

Agricultural varieties. Names of agricultural varieties are usually descriptive of duration, grain and plant pigmentation, and panicle shape. It is of common knowledge that the wealth of varieties and varietal names show the antiquity and the importance of a crop in the locality. Basu (1890) mentions five varieties cultivated in Bengal (1) The Black or *Kariya*, most commonly cultivated (2) The white or *Charka* (3) The ant-headed *Dia-muri* of a motley colour (4) The *Burhi*, a late variety and (5) the *Bere*, a variety always grown mixed with ragi. In the Madras Presidency most of the samples collected have no special names except the general term *Samai*. However, a few had varietal names which are listed below with the characteristics of the samples.

Name and place of collection.	Duration in days.	Pigmentation.	Panicle.	Grain colour
Ajjamu, Kamakarai, Kollegal.	133	Mixture of P. and medium P.	Loose	Olive Brown (O Br.)
Aruppu Samai, Ramnad.	88	Mixture of P. and medium P.	Loose	Light olive brown (L O Br.)
Bele Samai, Mundigundum, Kollegal.	133	Medium P.	Branched and normal heads, half open panicles	Mixture of very light olive brown (VLOBr) and LOBr.
Chittan Samai, Reddiyur, Javadi Hills.	87	Mixture of P. and medium P.	Loose	LOBr.
Jupy Suwa, Monliguda, Jeypore.	108	Mixture of P. and G. T.	One-sided	Mixture of VLOBr and LOBr.
Karboka Samai, Ambrampalayam, Pollachi.	81	Mixture of P. and medium P.	Compact	Mixture of LOBr. and OBr.

Kar Samai, Okkilipalayam, Pollachi.	83	Mixture of P. and medium P.	Compact	Mixture of LOBr. and OBr.
Kollu Samai, Kumblankolam, Palur.	102	Medium P.	Loose	Mixture of VLOBr. LOBr. and OBr.
Malligai Samai, Manapparai.	132	Medium P.	Loose	LOBr.
Pedda Samalu, Parvathipuram, Vizagapatam.	132	Mixture of P. and medium P. and G. T.	Mixture of dropping and erect panicles	Mixture of VLOBr. and LOBr.
Perum samai, Ramnad.	135	Medium P.	One-sided	LOBr.
Perum Samai, Kumblankolam, Palur.	106	Medium P.	One-sided	Mixture of VLOBr., LOBr. and OBr.
Porukku Samai, Ramnad.	135	Medium P.	One-sided	LOBr.
Punam Samai, Taliparamba.	127	Mixture of P. and G. T.	Arched	Mixture of VLOBr. & LOBr.
Sada Samai, Manapparai.	132	Medium P.	Branch and half open	LOBr.
Vellai Samai, Punganur.	87	Mixture of P. and Medium P.	Loose	LOBr.

Extent of cropping. Figures are not available to know the exact acreage of this crop in India. In the Madras Presidency the normal area under this crop is 589,940 acres. About 21% of this area is in Salem, 18% in Anantapur, 13% in each of Coimbatore and Madura, 8% in Tinnevelly and 6% in North Arcot. The districts of Trichinopoly, Vizagapatam, Chittoor, Bellary, Ramnad and Malabar grow this crop to a certain extent, but the area is below 5%. The crop is unimportant in the other districts.

The Role of Samai in the system of cropping. The importance of *Samai* as a crop is neither in the total area cultivated nor in the money return it gives to the cultivator, but that it gives something in the shape of food-grain to the ryot, from a soil which may otherwise yield little or nothing. It is a hardy crop which can withstand drought better than most of the other cereal crops and also water-logging to a certain degree. If the crop fails, the cultivator stands to lose very little, for the cost of production is very small and the assessment of the land very low.

Cultivation of Samai. Season. With the receipt of the sowing rains, the *ryot* attends first to the more valuable crops and then only to *Samai*. Naturally he reserves his best lands to his more profitable crops and

sows *Samai* in the poorer ones. Often it forms one of the mixtures and as such its sowing coincides with other dry land crops. It may be said that the sowing season of *Samai* is determined according to the advent of the South-West monsoon rains, i. e., June—July or August in the districts of Malabar, Coimbatore, Salem and Anantapur, the Agency tracts and in parts of Madura, Ramnad and Trichinopoly districts. In parts of Coimbatore and Tinnevelly districts it may also be sown in August—September. Rarely it is grown in April with the hot weather rains.

Rotations. The scope for rotations is very limited because of the nature of the soil on which it is sown. In single-crop dry lands of an inferior type as in the central division of Anantapur district, *Samai* follows horsegram in a two-year rotation. In parts of Salem, which are favoured by both the monsoons, *Samai* is sown in the South-West monsoon season and is followed by horsegram in the North-East monsoon. In parts of Tinnevelly near the Western Ghats, it is grown as a second crop in October—November after a cholam crop. In the uplands of Malabar and in Bengal, *Samai* follows dry land paddy or blackgram. In Bombay it follows *ragi* in dry lands. What is lacking by way of rotations is made up by mixed cropping. The usual crops grown as mixtures are *Samai, cumbu,* and *varagu,* among the cereals, lablab, horsegram and blackgram as pulses and occasionally mustard, gingelly and castor also.

Cultivation. *Samai* is cultivated only as a rainfed crop. It is seldom raised on garden lands, chiefly because better crops are selected for such lands and the increase in the outturn of *Samai* would very seldom pay for the cost of irrigation. With the advent of rains, the land is broken up with an ordinary plough. Two or three ploughings are usually given. Very little manure is applied, the available manure being used up for more paying crops. The seed is sown broadcast at the rate of about 10 lb. per acre, (when sown pure) and covered by ploughing once or twice. The field is sometimes levelled with a brush harrow or a levelling board. One weeding is usually given and nothing more is done until harvest time. This method of cultivation is common in almost all parts of India, the only exception being that the crop is sometimes transplanted in parts of Bombay. A special kind of cultivation of this millet, "the shifting cultivation" is prevalent in many hilly parts of India especially in Madras, Bombay, Bengal and Central India.

Harvest. The crop is cut close to the ground, tied up into sheaves and allowed to dry. When fully dry, it is threshed out by cattle if there is a sufficient quantity, or simply trodden down by foot. When cultivated on the hills, the crop is cut half-way leaving a stubble of $1\frac{1}{2}$ to 2 ft. in length, which is subsequently burnt to form manure for the next crop.

Duration. *Samai* takes usually $3\frac{1}{2}$ to 4 months to mature. There are varieties which mature in $2\frac{1}{2}$ to 3 months. Some of the hill varieties from the Agency tracts take about five months to mature.

Yield. The yield varies from 200 to 500 lb. of grain and 800 to 900 lb. of straw (semi dry).

Grain. The grain is husked before cooking. The husk forms about a third of the grain. The husked grain is cooked like rice and eaten. In parts of Tinnevelly and Malabar the grain is boiled before husking, similar to the parboiling of paddy. The rice is sometimes ground into flour and cakes are made out of it. As a food, *Samai* rice is not very tasty and is seldom preferred to any other grain if available. According to Church (1886) the analysis of *Samai* grain is as shown below:—

Water	10·2
Albuminoid	9·1
Starch	69·1
Oil	3·6
Fibre	4·6
Ash	3·5

The nutritive ratio is 1: 8·4 and the nutrient value of 85.

Straw. The cattle are fond of the straw, but in South India as a fodder it is considered inferior to that of paddy and *ragi* straw. In Northern and Central India, the straw has little value as fodder. It is cut and put into the manure heap or simply burnt down to form ash for the next crop.

Anthesis and Pollination. The only record available is that published by Youngman and Roy (1923). They have stated that the time between the opening and closing of the flower is 15 to 20 minutes only. At Nagpur, the flowers open between 9-30 and 10-30 A. M. With the commencement of the opening of the glumes, the styles and the filaments spring out at once, with explosive suddenness. Self-pollination is the rule in this crop.

Detailed studies were made at the Millets Breeding Station, Coimbatore on the anthesis and pollination in *Samai* in the year 1936.

Emergence of the Panicle. As in the case of *ragi,* (Ayyangar and Wariar 1934) the flag, the leaf subtending the panicle, cannot be differentiated from other leaves and hence the emergence of the panicle which is contained in the sheath of the flag has to be closely watched. From the emergence of the tip of the flag from the last leaf-sheath, it takes four to five days for the appearance of the inflorescence. In many cases the inflorescence does not emerge completely from the sheath of the flag; the lowermost branches remaining inside.

Order of anthesis. The opening of the flowers commences on the second or third day after the appearance of the panicle. The flowering progresses from the top to the bottom of the panicle. The maximum number of flowers opens on the 6th or 7th day. It takes about a fortnight to complete the flowering in a panicle. Observations were also made on the period of opening of flowers. It shows that in fair weather, the flowers begin to open by 9 or 9-30 A. M. The flowering progresses rapidly upto 10-30 or 11 A. M. after which it begins to decrease gradually and stops by 11-30 A. M. If the weather is cloudy the flowers may continue to open

upto 12 noon, but not afterwards. Differences in the season of sowing or methods of cultivation do not affect the order of anthesis, or the period of opening of flowers in a day.

Detailed observations were made on a number of individual flowers. The following table gives the average time required for each stage of the anthesis.

Details of anthesis.

	Average time taken	
	On a clear day.	On a cloudy day.
	min.	*min.*
Glume begins to gape	0	0
Stigma and anther visible (begin to emerge)	1	19
Anthers emerge (out of glume)	1½	19
Beginning of dehiscence	2	20
Completion of dehiscence	2	21
Stigma separate and become divergent	2	21
Glumes begin to close	3½	21
Glumes close completely	5½	22
Stigma begins to wither	6½	22
Stigma withers completely	19	28

The first sign of the opening of the flower is seen when the third glume slightly separates from the fourth glume. The palea then begins to separate itself gradually from the fourth glume. The opening of the flower is brought about partly by a swelling of the lodicules and partly by pushing from inside by the growing anthers. In fair weather, the opening of the flower is a quick process and is accomplished in one to three minutes. If the weather is cloudy the opening may take up to 20 minutes, the rest of the process being similar.

Within a minute of the gaping of the glume, the filament of the anthers elongate and by the time the glume is completely open, the three anthers as a column reach the mouth of the gaping glume with the stigmatic branches protruding from its periphery. The dehiscence of the anther takes place at the mouth of the glume or just before the anther reaches that position. The free pollen gets dusted on to the stigma. The filament then elongates and the anthers become pendant. As a result of this elongation of the filaments and spreading out of the anthers, the stylar arms that were caught up within these filaments are able to diverge and take up a position on either edge of the glume, exposing the two stigmas. The whole process of anthesis is fairly rapid and is completed in two or three minutes. Immediately after the anthers assume their pendant form, the glume begins to close. This closing is completed in about two minutes leaving the anthers and the stigma outside. A glume once closed never reopens. From the foregoing account it would be clear that self-pollination is the rule in this millet. The percentage of natural crosses occurring in *Somai* is very low (about 0·05).

Artificial Hybridisation. The artificial emasculation and pollination of this millet is rather a difficult process. However, the glumes can be opened and anthers removed with a fine-pointed forceps. The desired pollen can then be dusted on to the stigma. Such operated flowers are enclosed in a glass tube in order to exclude foreign pollen. The percentage of success depends mainly on the dexterity of the operator. An easier method of hybridisation is "the contact method" of crossing which is described in detail in connection with the anthesis and pollination in *ragi* (Ayyangar, and Wariar, l. c). The percentage of F_1s obtained by this method ranges up to 5.

Inheritance of Characters. Anthocyanin Pigmentation. Two broad groups may be distinguished in *Samai*, one with purple pigmentation and the other without it, the "Green-throughouts". Among the purple-pigmented plants, two types are distinguishable and are designated, Purple and Medium purple. The characteristics of three types of pigmentation are given below.

Purple (*P*). In this type the pigmentation is manifested on the leaf, the leaf-sheath, the exposed internodes, the glumes and the stigma. The anthers are orange in colour. It is interesting to note that the node and the junction of the leaf are not coloured in any of the pigmented types.

Medium Purple *(Med. P.)* This type has the leaf, the leaf-sheath, the exposed internodes and the stigma coloured purple. The glumes are green and the anthers orange.

Green Throughout *(G. T.)* The plant is free from purple pigmentation on any of its parts. The anther is orange and the stigma colourless.

Crosses were made for elucidating the inter-relationship of these types of pigmentation. A cross between P. M. 21 (G. T.) and P. M. 31 (P.), gave the F_1 as Purple. In the F_2 it segregated into 53 P. and 18 G. T. indicating a 3:1 ratio. Another cross between P. M. 33, (G. T.) and P. M. 27, (Medium P.), gave a Medium Purple F_1 and segregated for 56 Med. P. and 16 G. T. in the F_2 indicating a 3:1. A third cross between P. M. 27, (Med. P.) and P. M. 30 (P.), gave a Purple F_1 and segregated into 103 P. and 34 Med. P., showing a 3:1 ratio. Crosses were made between P. M. 33, (G. T.) and P. M. 31, (P.) which gave Purple in the F_1 and 64 Purple, 23 Med. P., and 27 G. T. in the F_2. Its behaviour is given below:—

Generation No.	Family No.	Behaviour		
		P.	Med. P.	G. T.
	Parents	P. M. 31		P. M. 33
F_1	Cross P. M. XII and XIII	F_1		
F_2	P. M. 133 and 134	64	23	27
	X^2 = ·33 P between 8 and ·9.			
F_3	1 family	89		
(From P.M. 133)	2 families	141	44	
	3 families	90		31
	5 families	142	45	58
	3 families		176	
	3 families		111	38
	2 families			72

A Factor P is responsible for the production of Purple pigmentation on the body of the plant and stigma of the flower, thus giving a Medium purple plant. P is a simple dominant to p the Green-throughouts. A factor H colours the glume purple thus producing a Purple plant. H is a simple dominant to h. The effect of H is noticeable only in the presence of P. The interplay of these two factors P and H thus results in a 9 : 3 : 4 ratio of P. (PP HH) : Med. P. (PP hh) : G. T. (pp HH or pphh). The behaviour is parallel to the one observed in *Eleusine coracana* (Ayyangar *et al*, 1933).

Grain Colour. Grain colour in *Samai* can be grouped into three types viz., very light olive-brown or the white grain ; Light olive-brown and olive-brown, popularly known as *Karum Samai* or *Nalla Samalu* in Madras and as *Kariya* in Bengal. The inter-relationship of these three types has been worked out and is presented below.

A natural cross, P. M. 167, having a very light olive-brown grain was spotted in P. M. 21, a Light olive-brown grained type. In the F_2, it segregated into 98 Very light olive-brown and 29 Light olive-brown grains, indicating a monogenic segregation. Another family, P. M. 60 (Light olive-brown grain) segregated for 103 Light olive-brown and 41 Olive-brown grains showing a 3 : 1 ratio. Having observed these monogenic differences between successive groups, crosses were made between P. M. 33, Very light olive-brown and P. M. 20, Olive-brown type. The F_1 had Very light olive-brown grain. In the F_2 there were 22 Very light olive-brown, 18 Light olive-brown and 2 Olive-brown grained plants, a ratio suggesting a 9 : 6 : 1. The F_3 behaviour given in the accompanying table confirms the ratio obtained in the F_2.

Generation No.	Family No.	Behaviour		
		Very light olive-brown	Light olive-brown	Olive-brown
	Parents	P. M. 20		P. M. 33
F_1	Cross P. M. XIX	F_1		
F_2	P. M. 136	22	18	2
	X^2 = ·55 P between ·7 and ·8			
F_3	2 families	190		
	6 families	277	89	
	4 families	166	108	17
	5 families		484	147
	3 families		353	
	2 families			187

Two additive factors I_1 and I_2 act as inhibitors on the olive-brown grain (X), the colour base. When any one of these factors is present, the colour of the grain is Light Olive-brown and when both are present, the grain becomes Very light olive-brown or white, thus giving a factorial composition of i_1i_2X for Olive Brown, i_1I_2X or I_1i_2X for Light olive-brown and I_1I_2X for Very light olive-brown grain. These factors have no relation with the plant purple pigmentation groups.

Albinism. One family P. M. 217, when sown was found to segregate for green and albino seedlings. Counts taken from P. M. 217 gave 1044 green seedlings and 72 albino seedlings showing a 15:1 ratio of green to albino. From the surviving greens fortyfive single plants were carried to the F_3 generation. Of these nineteen were pure for green seedlings fourteen segregated for green and albino as 3:1, while twelve gave 15:1 ratio of green to albino.

Generation No.	Family No.	Behaviour		
		Green	Albino	
F_2	P. M. 217	1044	72	$X^2 = .06$
F_3	19 Families (pure)	1637		$P > .8$
P. M. 217	14 Families (3 : 1)	1315	421	
(1—45)	12 Families (15 : 1)	1590	109	

As in the case of *Eleusine coracana* (Ayyangar and Krishna Rao, 1931) two factors C_1 and C_2 are responsible either alone or together for the production of chlorophyll in *Samai* also. In the absence of both of these factors, the plant is an albino and dies off in about ten days.

Pests and Diseases. There is no record to show that this crop is subject to the attack of any serious insect pest. *Samai* (Butler 1918) is subjected to the attack of a fungus known as *Uromyces linearis*, B. and Br. The fungus is known only in India, Ceylon and the Phillippine islands and no information is available as to the extent of the damage which it causes. It is a rust affecting the leaves of the plant.

Summary. This paper presents a brief account of a minor millet, *Samai—Panicum miliare*, Lamk.

Studies on anthesis and pollination have shown that the flowers open between 9 A. M. and 12 noon under Coimbatore conditions and that self-pollination is the rule. Emasculation and artificial pollination can be done with a fair amount of success. Very good results can also be obtained by "contact crosses".

Two types of purple pigmented plants, Purple (PH) and Medium purple (Ph) are met with, while with p, the plant is green-throughout. A segregation where these three groups occur has given a 9 : 3 : 4 ratio of P, Med. P and G. T.

Three types of grain colour viz, Very light olive-Brown, Light olive-brown and Olive-brown occur in *Samai* by the interaction of two additive factors I_1 and I_2, inhibitory in effect on Olive-brown grain.

Albinism was noted in the seedlings of *Samai*. Duplicate factors C_1 and C_2 are responsible for the production of chlorophyll either alone or together.

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The "Nendran" or Malabar Plantain.

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The Nendran is a type of plantain chiefly grown on the West Coast of the Presidency and abundantly in Malabar. Although sporadic efforts have been made to grow this crop in other parts of the Province, it has not been successful outside Malabar and parts of South Kanara. Probably the partiality of this crop for the porous well drained laterite soil and the heavy rainfall of the Coast is responsible for its coming up well only in these tracts.

Uses. The fruits both raw and ripe are available in important towns of Malabar all the year round. It is much bigger than the ordinary plantain fruit, and is a favourite among the people of the West Coast. It forms a part of the New Year present on "Vishu" from the tenant to the landlord or on festive occasions like 'Onam', etc. Both ripe and raw fruits are used in all households in various ways. The raw fruit is used for culinary purposes either by itself or mixed with other vegetables. After peeling the skin and slicing, the well matured fruits are fried in oil and preserved either salted or sweetened in jaggery syrup. The ripe fruits are consumed either in their natural state or by cooking in steam or baking in hot cinders. They are best eaten when the rind becomes flecked. The fruits are largely used in the preparation of 'prathaman', 'halva', fruit salad and many other sweets

and can also be preserved either in honey or syrup. 'Figs' are prepared by slicing well ripe fruits whose rind has been removed, and dried in the hot sun for 4—5 days.

The pulp of fruit is rather hard compared with other varieties of plantains and keep for fairly long period (10—15 days) after ripening and do not easily fall off from the bunch. Due to the keeping quality, the export trade of this commodity of late, to particularly large towns such as Madras, Trichinopoly, Madura and Coimbatore has been on the increase.

Like the coconut tree, almost every part of the plant is useful. The fruits, flower, flower stalk, and the rhizomes of the suckers are edible, while the sun-dried fibre is a good substitute for coir and other ropes. Usually no leaves are cut from the mother plant but the dry leaves are used for thatching sheds, etc.

Varieties. The chief varieties are *Nendran, Attunendran, Nananendran, Nedunendran, Tiruvodan, Chengaikodan, Myndoli, 'Kudiraivoly*, etc. They vary in duration, size of bunch, number, size, shape and taste of fruits, etc.

Cultivation. *Season.* Unlike other ordinary plantains, *Nendran* is not ratooned but fresh plantings done every year. The two main seasons of plantings are (i) with the outbreak of the N—E. monsoon in September and (ii) during November at the close of the rains. As off season fruits fetch better prices, wherever facilities exist, planting is resorted to during other months of the year also.

Planting. Planting is done both in wet and garden lands. As the crop cannot stand waterlogging the land selected should be well drained. As it needs copious irrigations also, facilities should be provided for watering the plants, when there is no rain. Pits large enough to hold the rhizomes are dug in the fallow field before planting is not usually resorted to. The land is dug up with a mammotee before pits are dug.

Seed material. Suckers taken from plants that have not flowered, are considered unsuitable as planting material. Suckers that sprout right below the bunch of the mother tree and the one just opposite to it are generally preferred for planting as they are supposed to yield big bunches. When these are not available all the available good suckers are planted. The suckers may be planted either as fresh ones immediately after digging them out or after they are dried in the sun. In either case topping is done nearly a foot above the rhizome. It is not an uncommon practice to have the stems of the planted suckers, trampled under the feet of buffalo. In this case the new shoots that sprout are more vigorous than the one coming out of a freshly planted sucker. Fresh suckers planted put forth new shoots within a week while the dried ones take from 15—30 days for putting forth new sprouts.

Manure. As the rhizomes are damaged by the grubs of rhinoceros beetle, no cattle manure is usually applied. A handful of ashes is put in the pit at the time of planting. When the young plants have put forth 3-4 leaves the base is opened and green leaf (about 20 lb.) and ashes (5 lb.)

are applied and covered. A second and bigger dose of the above manure is applied when the crop is about 3-4 months old. Some people give a third application of the same manure after 2 months from the date of second application. Burnt earth is considered a good manure. Though the crop responds well to application of concentrated manures it is beyond the reach of ordinary cultivators on the West Coast and as such not resorted to.

After cultivation. Inter-cultivation by use of bullock power is not practised. The field is usually dug up with mammottee after the first manuring is done and the plants are simultaneously earthed up. A second and third digging and earthing up may be given if necessary according to the nature of the condition of the field. It is advisable and often necessary to prop up the flowered plants by means of dead standards in order to avoid breaking of the plants during high winds. In wetlands, cross drains will have to be dug between every two rows of plantains to drain away the excess water. These can be utilised as irrigation channels as well.

Irrigation. Where flow irrigation is possible, it is naturally economical to make free use of this water. The fields are flooded when necessary and all the surplus water is drained away. Usually the plantain cultivation is done under lift by picotah. Where sub-soil spring is high, pits are dug in the middle of the plantation and water is baled out by human-labour in pots and supplied to the plants. The interval between irrigations will naturally depend upon the method of supply and quantity applied. Copious irrigations are considered necessary after the plants attain full growth and put forth bunches.

Fruits. Bunches begin to appear 7—9 months after planting depending upon the treatment received and the variety planted. The plants will then be 7—8 ft. high and would have produced about 30 leaves half of which will still be green and fresh.

Each bunch will have 4—5 hands and from 30—50 fruits. It is not uncommon to see big bunches with 60—70 fruits. When all the hands have formed, the flower is cut away so that the fruits will have maximum advantages for growth. The bunch will begin to ripen 3 months from the date of flowering. For culinary purposes harvest will commence even after 2nd month. The average weight of a bunch with 50 fingers will be 20—25 lb. depending upon the size of the fruits.

Economics. The following is a rough estimate of the cost of cultivating an acre and the return that can be expected in normal seasons.

Cost of cultivation.

	Rs.	As.	Ps.
Cost of preparing the land	6	0	0
Cost of 700 suckers	21	14	0
Digging pits and planting	9	0	0
2 diggings and earthing up and providing standards	20	0	0
Irrigation	22	0	0
Total.	78	14	0

Receipts.				
600 bunches of 40 fruits each	24000			
100 ,, 30 ,,	3000			
Total.	27000			
@ Re. 1 per 100		270	0	0
700 saleable suckers		21	14	0
Cost of fibre, flowers, etc.		14	0	0
	Total.	305	14	0

Net profit per acre. Rs. 227 or 225. More profit can be obtained in seasons of favourable price or if all the suckers produced are sold as seed material.

Conclusion. Cultivation of *Nendran* plantain is generally very paying and it is sure to tempt anybody in venturing on a large scale plantation. But there is the other side of this picture. In spite of all precautions taken very often large areas of this crop are damaged by high cyclonic winds causing irreparable loss to the ryots. The loss in such cases will be immense especially if large areas are owned by one individual. For this reason large areas are conjointly cultivated by many ryots or each individual owns only a limited number of plants. The *Nendran* is and will continue to be the plantain of Malabar.

Ecological Notes on the Sugarcane stem borer (*Argyria, sticticraspis*, Hmp) in the Irwin Canal Area, Mysore.

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Introduction. The observations recorded in this paper were made in 1938 in a small plot $\frac{1}{4}$ acre in extent, situated amidst large blocks of sugarcane at Satnur Farm 3 miles from Mandya in the Irwin Canal tract, Mysore. This plot was divided into ten equal sub-plots of one gunta ($\frac{1}{40}$ acre) each which were planted, one in the middle of every month from February to November 1938. The observations recorded herein were made on each month's planting from the third till the twelfth week after planting. No control measures of any kind against the borer were undertaken, and there was no other deviation from the usual cultivation routine.

This work was undertaken with the purpose of obtaining comprehensive data relating to (a) Egg-deposition rate of *Argyria sticticraspis* Hmp* in different months of the planting year, (b) the percentage of egg mortality due to the egg-parasite (*Trichogramma minutum*, Riley) and other natural factors, and (c) the effect of the resultant hatch of larvae on the young crop. This enquiry was suggested to the author by Tucker's work (ii) in Barbados; but owing to the great difference in the bionomics of the pests concerned,

* No mention of *Diatraea Nenosata* Hmp, which also attacks sugarcane in its younger stages is made in the paper to avoid confusion, as its incidence is extremely slight.

and the methods of cultivation, a considerable deviation from his plan of work was inevitable.

The plot selected for this study, while situated in an extensive sugarcane block was carefully excluded from borer control work, so that, while allowing for normal incidence of attack, there was no artificial check imposed on the pest, or disturbance of the effect on it of its egg-parasite and other natural factors tending to reduce its severity. Thus the data presented in this paper are based on the incidence of the borer in its natural (without control) state and it is believed they can therefore be utilised as a working guide for the application of control measures on a field scale.

Methods of study. In each sub-plot 24 × 15 feet furrows in 3 rows (of 8 furrows each) were opened and 250 setts of H. M. 320 cane were planted in the middle of every month from February to November 1938. January and December were left out as it is not usual to plant sugarcane in those two months in this area. Irrigation, manuring and weeding were on the usual lines and at proper intervals. Observations were begun in the third week after planting and were continued till the twelfth week, after which a detailed study became difficult on account of the great mass of foliage developed by them. Besides, the marked diminution in the density of egg-laying as the crop approached this age made it unnecessary to continue weekly examinations beyond this age.

At every weekly examination every plant in the sub-plot concerned was carefully searched for *Argyria* egg-masses deposited on it. Immediately one was located, its condition (see below) together with the number of eggs in it was recorded. The egg-masses located at the weekly examinations fell into the following four categories, depending on the interval between actual oviposition and the day of examination. (a) *Fresh-laid.* Uniformly pale yellow or dirty white in colour, (b) *Parasitised.* Completely blackened, if parasites were still inside, or black egg-shells with a circular hole in the middle, if parasites had emerged, (c) *Hatched.* If hatching had occurred, pale silvery egg-shells were left intact ; in eggs ripe for hatching, the larval head was seen as black spot in the middle of the yellow egg and these eggs were taken as hatched out for record purposes, and (d) *Damaged.* Torn open or eaten up entirely (by ants, etc.) with only silvery scar left of the individual eggs.

Obviously, except the fresh-laid eggs, those belonging to other categories were laid within about 3 days after the *previous* weekly examination so that there was sufficient time for them to show their final condition at the first examination. The number of eggs in such egg-masses and their condition were noted and they were then left in position. It is possible that a number of egg-masses washed away entirely by rain or irrigation water before examination have not come into account but as they could not have been numerous except during rains, and as they do not affect conclusions relating to egg parasitism or damage to crop, it is believed that they may not vitiate the data presented in this paper.

When a fresh-laid egg-mass was found, the blade or the leaf-sheath carrying it was marked in white lead and the plant noted with a stake near it. Such marked egg-masses were examined, first of all, at the next weekly examination and their fate—whether parasitised, hatched, damaged or washed away was duly noted. An egg-mass located at one examination was rarely missed at the next, and in fact whatever happened to it, unmistakable evidence of it was invariably available, thus showing that observations at intervals of less than a week were not necessary.

Thus, the history of a batch of egg-masses was normally fully worked out in two weeks.

Along with the study of egg-deposition on the above lines, the percentage of attack on the young crop in the sub-plot under examination was calculated by actually counting the number of dead hearts and healthy seedlings separately every week the observations were in progress. This served as a ready (if rough) index of *larval survival*. Except for merely counting them, dead hearts were not examined for the presence of larvae in them nor were they removed or disturbed otherwise.

Incidentally the percentage of germination for each month's planting was also calculated on the assumption that with 250 three-eye-bud setts planted in each sub-plot, 750 primary shoots would represent cent per cent germination. The progressive increase in the percentage of germination was worked out for each sub-plot from the first week of observation for 3 or 4 weeks afterwards till the last eye-bud had a chance to sprout.

The sub-plots were harvested in due course in 1939 and both the number of millable canes and the actual weight of cane obtained were recorded separately for each sub-plot. The various data collected in the course of these observations are presented in a condensed form in Tables I and II.

Discussion. (a) *Egg-deposition rate : Argyria* ovipositional activity reached its peak in May (on March and April planting) and was negligible in December on October and November-planted cane. This is in accord with field observations of borer incidence in general; summer planting is subject to serious borer attack while "B" season planting (planting after June) is usually fairly free from the pest. This difference in infestation between the two seasons of planting may be ascribed, among other reasons to the effect of rain, beneficial to the crop, and adverse to the pest. The "B" season crop is more vigorous and profuse in tillers than the earlier planting; for the pest, ovipositional activity is greatly reduced (see below) and a number of egg-masses are washed away before hatching.

Further, in every sub-plot there was heavier egg laying in the first half of the period of observation than in the second half, i. e., the crop during the first month after germination appears to be more attractive for egg laying than in the second month, as seen from the following table :—

TABLE I. Planting, Germination, Borer attack, and Harvest data.

Planting.		Germination.		Borer-attack.				Harvest.				Remarks.
Month.	Date.	Percentage.	Recorded on	Total No. shoots.	Number healthy.	Number attacked.	Percentage of attack.	Date.	Age of crop.	No. of canes.	Weight of canes.	
									Months.		lbs.	
Feb.	18—2—38	64·0	5—4—38	1522	914	608	40 0	31—3—39	13½	465	541	
March	18—3—38	53·3	21—4—38	449	114	335	74·6	7—5—39	14	160	169	Canes thin and short.
April	15—4—38	64·4	12—5—38	576	100	476	82·6	7—5—39	13	330	690	Canes thin and tall.
May	16—5—38	33·3	16—6—38	289	106	183	63·6	28—7—39	14½	250	952	,, well grown.
June	16—6—38	73 2	28—7—38	1711	1227	484	28·2	15—8—39	14	760	2688	Very good growth.
July	14—7—38	62·4	18—8—38	1012	850	162	16·0	15—8—39	13	826	2940	,,
August	18—8—38	82·5	15—9—38	1630	1384	246	15 0	29—9—39	13½	767	2268	,,
Sep.	14—9—38	61·0	27-10—38	853	759	94	11 0	31-10—39	13½	804	2352	,,
Octr.	14-10—38	30·4	24-11—38	428	421	7	1·6	21-11—39	13	455	1260	Stunted and bushy.
Novr.	17-11—38	48·1	29-12--38	511	500	11	2·1	21-11—49	12	515	1460	,,

TABLE II. Egg-Deposition Data.

Planting month.	Date of		Egg-Deposition.		Parasitisation.		Hatching.		Eggs lost & Damaged.		Remarks.
	First Examination.	Last Examination.	No. of Masses.	No. of eggs.	No. of eggs.	Percentage.	No. of eggs.	Percentage.	No. of eggs.	Percentage.	
February	8--3—38	28—4—38	33	1352	378	27·9	822	60·8	152	11·2	
March	5—4—38	26—5—38	119	5311	3151	59·3	1018	19·1	1142	21·5	
April	5—5—38	30—6--38	197	8392	5643	67·2	582	6·9	2167	25·8	
May	2—6—38	28—7—38	36	2007	907	45·1	765	38·1	335	16·6	
June	7—7—38	25—8--38	80	3127	736	23 5	1449	46·3	942	30·1	
July	4—8—38	22—9—38	13	441	104	23 5	155	35·1	182	41·2	
August	1—9—38	3-11—38	5	136	17	12 5	75	55·1	44	32·3	
September	6-10—38	1-12—38	6	219	81	37·0	138	63·0	...	...	
October	3-11—38	29-12—38	4	166	78	47·0	57	34·3	31	18·6	
November	8-12—38	26—1—39	1	18	18	100 0	...	...	...	...	

TABLE III. Showing rate of Argyria Egg-deposition.

Sub plot planted in	No. of eggs laid during		No. of eggs noticed			Remarks.
	I period.	II period.	on this plot	on next month's plot	on (date)	
February	1028	324	73	80	5—4—38	The dates are those on which the second period of observation for the concerned plots commenced.
March	2911	2400	433	1478	5—5—38	
April	7616	776	214	179	2—6—38	
May	1763	244	117	1007	7—7—38	
June	2786	341	241	174	4—8—38	
July	381	60	...	...	1—9—38	
August	44	92	92	'42	6-10—38	
September	135	84	84	...	3-11—38	
October	142	24	...	18	8-12—38	
November	18	0	...	...	...	

(b) *Egg-parasitism.* The percentage of natural egg-parasitisation (by *Trichogramma)* like the egg-deposition rate, was highest in May but registered a sharp fall from July onwards; the total absence of parasitism in September and cent percent parasitism in December may be left out of consideration as being abnormal due to poor egg-laying registered in those months. This decline in the activity of the egg parasite coincides with the season of rain and heavy wind in this tract,—factors which are likely to operate unfavourably against a fragile parasite like *Trichogramma.*

TABLE IV. Showing the monthly percentages of Egg-parasitisation (a) in general and (b) in the experimental area.

Month	General collection		Experimental area		Remarks
	Number of eggs	Percentage	Number of eggs	Percentage	
March	4107	23·5	1028	15·3	
April	4967	48·3	3235	51·4	
May	6191	43·4	10,016	64·6	
June	2433	17·9	2574	65·4	
July	5233	19 8	2995	25·2	
August	4973	27·6	772	25·4	
September	5402	35·2	104	...	
October	3372	22·8	227	26·0	
November	2637	63·8	226	41·1	
December	3072	28·6	42	100·0	

During the entire period of this work a separate monthly record of egg-parasitism was maintained by collecting a number of *Argyria* egg masses from different parts of the tract every week, and working out the percentage of parasitisation from this material for each month. These monthly percentages are given below along with corresponding figures from the experimental area. It will be noticed that there is a rough similarity between the two sets of figures except those for June, September and December. The difference in September and December may be ascribed to the small number

of eggs laid in those months in the experimental plot, but, as regards June it may be presumed that sufficient host material (*Argyria* eggs) was available in a compact nearby plot in the experimental area, to induce an exceptionally high percentage of parasitisation. These exceptions apart, there is sufficient resemblance between the two sets of figures to warrant the assumption that the figures from the experimental area represent the normal seasonal fluctuations of the parasite.

(a) *Hatching and attack.* The number of dead hearts caused by the entry of *Argyria* larvae was much less than the number of larvae that actually hatched out; on the total it was about half (total number of hearts; 2,575 and total number of larvae hatching out 5,061). It is obvious, therefore, that initial larval mortality (i. e., prior to actual penetration) is fairly high, especially as successful larvae are liable to damage more than one shoot each. Further, initial larval mortality appears to be proportionate to the number of larvae hatching out, or in other words, the larger the number of larvae hatching out, the smaller, *proportionately*, the number of shoots attacked. Thus in the plots planted from February to June 4,636 larvae hatched out and only 2,086 deadhearts appeared, while in the plots planted from July to November 425 larvae hatched out and 489 dead hearts were counted. Probably the lack of a sufficient number of young shoots suited for boring into, might be one of the reasons for heavy larval mortality during the period February to June; thus, for 4,636 larvae that hatched out there were only 4,547 shoots (including tillers) available, while in the latter period (July to November) 4,434 shoots were available for only 425 larvae to bore into.

Although stray dead hearts were noticed in every plot from even the first week of examination, a sudden and conspicuous increase in their number was observed somewhere about the 6th week after planting; obviously this stage marks the beginning of real borer attack on the crop. Incidentally the first batch of larvae to hatch out in the plot had done so a fortnight earlier (see following table) and allowing them this interval for dispersal and entry into the shoot as described by Subramaniam and Ramiah (i) it may be persumed that they were responsible for initiating attack. The peak of attack was reached round about the 8th week after planting and in the next 2 or 3 weeks dead hearts were seen in such numbers as to constitute a serious attack. Subsequently, with the appearance of tillers and the crop reaching the age of final earthing up a marked fall in the percentage of attack followed, showing that the age of vulnerability for *Argyria* attack had passed.

(d) *Attack and tonnage.* It is not possible to correlate directly the percentage of borer attack with the tonnage of cane harvested owing to the long period of growth (nearly a year) occurring after the severity of borer attack ends and during which the crop is able to recover from the set-back imposed on it by the pest. Besides other variable factors like cultivation factors (including manuring) and the effect of Top Borer (*Scirpophaga* spp.)

infestation also affect the tonnage. But it is evident from general observation and a study of data presented in this paper, that *Argyria* attack, especially when serious, not only causes a temporary set-back in the initial stages (involving delay and extra expenditure) but also affects the tonnage adversely. Thus the weight of cane harvested from sub-plots planted from February to May (see table I) which suffered from a serious infestation was much less than that obtained from sub-plots planted in the subsequent months. Generally, a bad infestation confers a patchy appearance on the crop which is not erased to the last and which results in an unequal stand of cane and consequent loss of tonnage; repeated attack on a stool turns it into a busy growth from which no millable canes are obtained at harvest. Again it is common experience that "B" season (July to November) planting with little or no borer attack on it yields a higher tonnage in this area than the "A" season cane (planted from February to June) which is normally subject to severe attack. While seasonal conditions and other factors have their own share in it, it is apparent that the severity or otherwise of borer attack is one of the factors responsible for this difference in tonnage between the two planting seasons.

TABLE V. Showing the course of Argyria attack.

Planting.	Attack began in	Percentage.	Peak of attraction.	Percentage.	First batch of larvae hatch out in.
February	7th week	31·5	8th week	42·1	5th week
March	6th ,,	61·0	9th ,,	75·0	4th ,,
April	5th ,,	34·4	9th ,,	84·4	3rd ,,
May	6th ,,	43·4	8th ,,	69·3	4th ,,
June	6th ,,	20·4	10th ,,	28·2	4th ,,
July	6th ,,	12·7	8th ,,	25 6	4th ,,
August	6th ,,	15 8	7th ,,	16·7	8th ,,
September	6th ,,	6·0	9th ,,	10·3	4th ,,
October	6th ,,	3·9	7th ,,	4·0	7th ,,
November	7th ,,	1·4	10th ,,	2·1	...

Summary. This work was undertaken with the object of obtaining data concerning the egg-deposition rate and the percentage of egg-parasitisation of *Argyria sticticraspis Hmp.*, the sugarcane stem borer, under natural conditions. A plot of land $\frac{1}{4}$ acre in extent was divided into ten equal sub-plots which were planted, one every month from February to November 1938. No borer control measures were adopted.

Weekly observations were made on each sub-plot from the 3rd to 12th week after planting; every plant was searched for *Argyria* egg-masses, and when one was located, the number of eggs in it and its condition (whether fresh laid, parasitised, hatched or damaged) was immediately recorded. Fresh-laid eggs were marked for examination during the subsequent week.

The percentage of attack was calculated from the number of dead hearts and healthy seedlings counted separately. Dead hearts were not removed.

The percentage of germination wss also worked out. The harvesting was attended to in due course in 1939.

Argyria egg-laying reached its peak in May and was negligible in December. The crop in the first month after germination appeared to be more attractive for oviposition than in the second month.

The percentage of egg-parasitisation by *Trichogramma* was highest in May but declined sharply from July onwards probably due to rain and heavy wind. There was a fairly close similarity between the monthly percentages of egg-parasitisation derived from the experimental plot and from general collections.

The rate of initial larval mortality was apparently fairly high, especially in the "A" season, probably due to an insufficient number of shoots available for boring into. Actual attack began round about the 6th week after planting and could be traced to the first batch of larvae hatching in the plot a fortnight earlier. The peak of attack was attained in about the 8th week after planting.

No direct correlation between percentage of attack and tonnage at harvest was found, as the crop had nearly a year to recover from the effect of borer attack, but the weight of cane harvested from the sub-plots planted from February to May (which suffered from 'severe attack) was much less than that obtained from the later planted sub-plots.

Acknowledgments. The writer wishes to express his gratitude to Mr. T. V. Subramaniam, the Mysore State Entomologist, for the encouragement and help given by him, to Mr. S. H. Bennur, Superintendent of Farms, Mandya, for affording facilities during the course of the work and Mr. M. Puttarudriah, Assistant Entomologist, for harvest of the experimental area in 1939 when the writer was absent from the Station.

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EXTRACT

The Production of High Vitamin A Milk by Diet. H. J. Deuel, Jr., Nellie Halliday, Lois F. Hallman, Cornelia Jonston and Albert J. Miller. The vitamin A content of the butterfat obtained from cows on a diet high in fresh alfalfa was coniderably increased by the administration of shark liver oil in daily doses of approximately 700,000 I. U. although lower amounts were ineffective.

The vitamin A in butterfat averaged 113 I. U. after administration of the vitamin A supplement at a level of 1,400,000 I. U. daily. In one cow, the level reached 170 I. U. per gram which value was also noted a month later. The increased amounts of vitamin A in the butters persisted without diminution over a five month period during which the experiments were continued.

There is a marked decrease in carotene which occurs even when doses of shark liver oil, too small to cause an increase in the level of vitamin A in milk are fed.

No toxic symptoms were noted and the cows remained in good nutritional conditions as reflected by the increased production of milk and butterfat.

The present experiments emphasize the lack of correlation between color of the milk and its vitamin A content. —The *Jour. Nutrition.* 22(3) September 1941.

Cotton Stem Weevil. In parts of Madras, where Cambodia cotton is grown over large areas, healthy plants wither away all of a sudden due to the damage caused by the cotton stem weevil. In seasons of severe incidence, the loss by death of plants may be as high as 25 per cent. To overcome the ravages caused by this pest the Indian Central Cotton Committee is financing a scheme, the object of which is to devise effective control measures based on the study of the life history, habits and bionomics of the insect, the nature of the plant's resistance to weevil infestation and the efficacy of the biological methods in checking the spread of the pest.

Problem of control. The association of the pest and the host has been found to commence from the time the egg is laid by the adult insect in a small cavity made for the purpose in the cooler region of the stem just above the ground level. The most critical period in the relationship between the host and the pest is when the insect cuts out a ring of the functioning tissue around the woody region during its travels inside the stem in search of food. The injury thus caused generally results in the death of the plant. After a period of active burrowing inside the stem, the larva pupates in a chamber excavated in the core of the stem and finally emerges as an adult insect through a previously made passage. The insect borer thus completes its life-history, from the egg to the adult stage, inside the stem and thus presents one of the most difficult problems in the field of insect control.

The attacked plants which survive to the end of the season escape death either by the exudation and formation in the larval gallery of wound gum which entombs the larva or by proliferation of tissues and development of one or more galls at the attacked part of the stem which prevents their lodging, or by both these means.

The weevil appears to attack all cottons, exotic and indigenous, and no variety, cultivated or wild, has so far been found to be immune to its infestation. Nadam cotton amongst the Asiatic and Bourbon and three Brazilian varieties, viz. Quebradinho, Verdao and Moco, amongst the New World cottons have, however, proved to be highly resistant. The nature of resistance in the case of Nadam and Bourbon cottons is mainly by rapid proliferation of tissues, while in the three Brazilian varieties the resistance is due to ready exudation of gum into the larval gallery.

It has been found that the weevil passes through three generations during the cotton season—September to March—at Coimbatore. In addition to cotton, it infests a large number of alternative host plants such as *bhendi*, hollyhock and several wild plants and weeds. The presence of a large number of such host plants near the cotton areas seems to preclude the effective enforcement of a close period to starve out the pest.

Attempts to control the stem weevil by means of its natural enemies have not so far yielded any successful results, while the pempheres larvae are parasitized by 15 or 16 different parasites the maximum percentage of total parasitism is very low, ranging from 0·2 to 5·2 per cent.

Promising hybrids. Gum formation appears to occur earlier and quicker in the Brazilian varieties than in Cambodia, on account of changes in the water soluble polysaccharides of the plants, but the relationship between resistance and the amount of polysaccharides present has not been found to be significant.

The local Camboida strain, Co. 2, has been found to be highly susceptible to attack, and attempts are being made to evolve a strain which is resistant. Notwithstanding their high degree of resistance, Brazilian varieties referred to above cannot be introduced in the tract, as all of them are perennial, late maturing, poor ginners, susceptible to jassids and defective as regards boll opening. Amongst the different hybrid populations under trial the progenies of Moco x Co. 2 cross have been found to be most promising in respect of resistance. As a result of comparison of the progenies of Moco x Co. 2 two cultures 7,176 and 7,178, which have shown low proportion of mortality and adult emergence, have been isolated. In order to introduce vigour and early maturity, they have been crossed with the newly evolved strains from Co. 2 x Uganda crosses. Trials are now under way to isolate resistant strains which are at the same time early maturing and superior to the local in economic characters. The criterion of selection is nil mortality and nil adult emergence; in other words, a plant which quickly floods all the burrows with gum and entombs the larvae. Special precautions are taken to create uniform incidence of the pest at all points of the field and to increase the intensity of infestation by spreading infested stems containing fully grown larvae and pupae, so that the resistant types may be spotted easily. *Indian Farming*, 2(11), November, 1941.

Restaurant Straws. Paper straws for sipping fruit juices and cold drinks are usually imported from the United States of America and some European countries. But owing to war their import is more or less cut off. Most of the restaurants, milk-bars and soda fountains may be finding it difficult to offer straws with their drinks. I would suggest the use of wheat straws instead of the usual paper ones.

The straws can perferably be gathered from the standing wheat crop. Arrangements could be made with cultivators who will be prepared to sell a portion of their crop at nominal cost after, of course, taking off the ear-heads. Suitable straws can also be selected from the undamaged harvested bundles of wheat. The straws could be cut into suitable size and sterilized. The most usual size for a straw is about nine inches.

The golden yellow colour of the straw makes it attractive and provided undiseased and uniform straws are selected, I am sure, the majority of users will really appreciate them. *Indian Farming* 2, (11), November, 1941.

Indian Canes Abroad. The sugarcanes Co. 419 and Co. 421 bred at the Imperial Sugarcane Station, Coimbatore, have done so well in several tracts in India that their performance at certain places outside India is not without interest. Two such reports on Co. 419 and one on Co. 421 are now available.

In Trinidad (Field Experiments on Sugarcane, Annual Report for 1940) the yields of Co. 419 and Co. 421 were 59·20 and 49·59 tons per acre, respectively, as against 48·78 tons from F. C. 916. 41·00 from B. H. 10 (12), 39·32 from Co. 313, 29·60 from C. P. 28/11 and 28·47 tons from C. P. 28/19. Co. 419 thus gave a significantly larger yield of cane than any of the other varieties. Co. 421 and F. C. 916 were significantly superior to B. H. 10 (12), which was in its turn significantly superior to only C. P. 28/11 and C. P. 28/19.

In the same report another experiment with the varieties Co. 421, Co. 419, Co, 213, Co. 290 and Uba is mentioned. The yield of cane per acre was 45·48, 41·78, 39·06, 30·10, 31·54 tons, respectively. Co. 421 thus gave a significantly larger

yield than any other variety. Co. 421 also gave plant cane of much higher quality than any other variety as the figures for tons of cane per ton of sugar were 7·76, 8·30, 8·92, 8·40 and 9·30 respectively. As a consequence of this, Co. 421 gave by far the largest yield of plant sugar. The actual figures for tons of sugar per acre were 5·87, 5·03, 4·38, 3 58 and 3·39 respectively.

In British Guiana (Sugar Bulletin No. 9, 1940) Co. 419 was tried along with four other varieties and gave a yield of 50·19 tons of cane per acre. The other varieties were POJ, 2,878 Co. 290, D. 32/35, D. 361/35 and yielded 41·35, 40·99, 31·89, and 26·86 tons of cane per acre respectively. The report adds, 'The recently introduced Co. 419 was outstanding, especially as regards tonnage. If it maintains the promise it has shown here and in the nurseries at Sophia, this cane is likely to be of considerable service'.

The above mentioned good performance of the Coimbatore-bred canes in the home of the famous Barbados and Demerara canes is noteworthy. It may be recalled that the British West Indies were among the very first, the other being Java, to improve their industry by the breeding of new varieties. Demerara also was one of the early centres of production of new varieties. If the Co. canes keep up to their early promise in Trinidad and British Guiana, they will afford yet another instance of the service of Coimbatore to the countries of the British Empire. *Indian Farming*, 2 (11), November, 1941.

Groundnut as a Human Food. Groundnut (*Arachis hypogaea* Linn.) is really a leguminous plant, although in their chemical composition groundnuts resemble nuts such as cashew, almond and walnut more closely than they resemble pulses. The plant is a native of Brazil, from whence it spread to Africa and Asia. It has been cultivated in the tropics and sub tropics for several centuries, and in India groundnut is an important crop. It is grown chiefly in Madras, but Bombay and the Central Provinces are also important centres of production. In normal times groundnut oil and cake are exported in large quantities to the United Kingdom and the continent of Europe. As a result of the war, exports from the Madras province dropped from 760,000 tons in 1938–39 to 282,000 tons in 1940–41.

The reduction of the export trade has produced a disposal problem. One method of disposal would be its wider use as human food and this raises the question of its nutritive value. Per 100 grammes, it contains about 25 to 33 grammes of protein, 40 to 50 grammes of fat and 10 to 20 grammes of carbohydrate. It is rich in phosphorus, but not in calcium. As regards its vitamin content, it contains some of the B vitamins, notably B_1 and an important member of the B_2 group, nicotinic acid, in fair amounts, but no vitamin A. Groundnut oil, like most vegetable oils, is devoid of this valuable constituent. *Vanaspati* or vegetable ghee, which is usually made from groundnut oil, does not contain fat soluable vitamins A and D.

Experiments with groundnut. In the Coonoor Laboratories a long series of experiments have been carried out on the value of various foods in 'supplementing' poor rice diets. Rats are given a diet which resembles in composition poor rice diets eaten by human beings. Different foods are added to this basal diet and their effect on the development of the rats observed. This method of testing provides a good idea of their nutritive value under Indian conditions—in fact it is in some ways a better index than detailed chemical analysis. If milk is added to the rice diet, the result is a striking increase in the growth rate and an improvement in the general condition of the animals. Groundnut, however, when given in amounts equivalent to 1 to 2 oz. daily in a human diet does not produce any striking supplementary effect. The conclusion is that groundnut, although it is rich in certain food factors, does not contain enough of the constituents which are most needed by the poor rice eater to make good the defects of

his diet. Milk, on the other hand, contains these in the correct proportions It is possible that the relatively low calcium content of groundnut is to some extent responsible for its failure as a supplement and its deficiency in certain vitamins in the B_2 group may also be concerned Experiments on this subject are proceeding.

Suppose half to one ounce of groundnut were distributed daily to poor children in schools. It is not to be expected that such a supplement would be as effective in improving their state of nutrition as a glass of milk. On the other hand groundnut taken in small quantities, is perfectly good food. Its high fat content makes it a concentrated food, with a high caloric yield per unit of weight. Since many poor school children are under, as well as, mal-nourished, any supplement which increased their total food intake would be of value. In normal times peanuts sold very cheaply in small paper bags are very popular among poor children in London.

Groundnuts as such have never been used as staple human food anywhere in the world. Consumed in large quantities they tend to be nauseating, probably because of their high fat content. Their main use has always been as a source of oil, the 'cake' which remains after the extraction of oil being employed as cattle food and manure. It is said that groundnut cake is used as human food in Spain. In U. S. A. so called 'peanut butter' has been fairly widely consumed, and in that country roasted peanuts are very popular. The inclusion of groundnut flour in small quantities in wheaten biscuits has been suggested.

The idea that groundnuts could be used in India as an important article of diet, replacing equivalent quantities of cereals such as rice may be dismissed. They could, however, be consumed in somewhat greater quantities as an addition to ordinary diets, either in the form of roasted nuts or as a sweetmeat with jaggery. Even a slight increase in consumption would help to dispose of surplus stocks. In the present circumstances it is unfortunate that they cannot be strongly recommended by the nutrition worker as an exceptionally valuable food, but there is no reason why their use as human food should not be extended (Note issued by the Nutrition Research Laboratories, I. R. F. A., *Coonoor.*) *Indian Farming*, 2, (11), November, 1941.

Gleanings.

Coconut Shell and Husk Ash. In view of the shortage and uncertainty of supplies of potash fertilizers several coconut estates are preparing both shell ash and husk ash, which are rich in potash and command a price of 3 $ per ton for 1 per cent. of potash, calculated as K_2O. The potash contents of the ash the shell and the husk are about 52 and 44 per cent., equivalent to returns of 156 $ and 132 $ per ton respectively.

Figures for the ash content of shell and husk are 0·7 and 2 8 per cent. while the proportions of shell and husk in the freshly-gathered nuts are 16·5 and 31·7 per cent. respectively. Thus, the husk is a much richer source of supply of potash than the shell.

To produce 1 ton of husk ash approximately 639,600 nuts are required; the shells would yield an additional 282 lb. of ash. The financial returns would be 132 $ for the husk ash and about 20 $ from the shell ash.

If shells alone are burnt nearly 510,000 nuts are required for 1 ton of ash.

Further details will be given in the November issue of the Journal. (*Malayan Agricultural Journal*) (29 (10) October, 1941.)

Food from the Air. Nitrogen from the air, in addition to being the main source of explosives, enters extensively into fertilisers and into the manufacture of a group of compounds known as plastics. Now as the result of brilliant research work, chiefly at the Agricultural College of the University of Wisconsin, it is used to replace protein in cattle feeds. Urea is not a protein, it is a compound of ammonia and carbon dioxide, but in ruminant animals it is converted to protein. The rumen teems with billions of microscopic plants—mostly bacteria, some of which seize upon non protein nitrogen and break it down to ammonia which in turn is used by others to make protein. Animals, unlike plants, have themselves no mechanism for synthesising protein.

Up to three pounds of urea can be used to a hundred pounds of grain concentrate, with which it must be well mixed. Above that rate harmful results are likely.

In great Britain where the importation of protein concentrate has been seriously restricted, the use of urea, if it can be spared from munitions, is likely to bring relief to the sorely tried farmers. *(Rhod. Agri. Jour.* 38 (4) April 1941.)

Kikuyu. Two articles on Kikuyu grass (*Pennisetum clandestinum*) appear in the New Zealand Journal of Agriculture for November. The grass, which is a native of Kenya was, according to P. S. Syme, introduced into New Zealand about 1919, and in Auckland Province at all events, is no longer welcome. On loose fertile soil Kikuyu spreads with alarming rapidity and once firmly established is very difficult to eradicate. It has been found in New Zealand that Kikuyu introduced to a rye-clover sward quickly suppressed the clover, and then lacking nitrogen, itself formed a stemmy sod-bound mat of runners of inferior feeding value. Joints of the runners were moved by the feet of cows to other fertile lands and spread with devastating rapidity, choking out clovers, and ruining the existing pasture. The grass, according, to the same writer, requires a very fertile or loose soil for its best growth. In respect of its growth on loose soil and its drought resisting qualities, both he and J. E. Bell, in another article, find much to commend Kikuyu, which was found to have a very definite value for covering slips, checking erosion on hill country, and in binding sand dunes. On land which is not agricultural, on sandy wastes which are threatening to drift and cover good agricultural land, Kikuyu has proved of the very greatest value, in conjunction with marram grass and lupinus. (*Rhod Agri. Jour.* 38, (2. February 1941.)

Kudzu. The kudzu*, which was fully described in the July issue of the Journal, is assuming growing importance in Australia although according to the Queensland Agricultural Journal, not very extensive trials have been made. American experience is entirely in its favour. Since the beginning of erosion control in America, 40,000 acres have been planted with this crop mostly in the South Eastern States. Everywhere it has earned a high reputation as a fodder crop and as a soil binder.

It is not seriously affected by drought, it grows rapidly, it restores fertility to the soil by adding nitrogen and organic matter, and it maintains a stand over long periods without yearly soil preparation and planting. It grows vigorously on eroded land when once established, and its dense cover protects the soil from beating rain. Not only is kudzu specially suited for the reclamation of badly eroded slopes, but it also produces a palatable hay and forage of excellent quality with a high feeding value. *(Rhod Agri. Jour.* 38, (2) February 1941).

Bee Venom Destroys Alcohol Poison. "Referring to alcohol and bee venom it is a well known fact that although they are chemically antagonistic, with regard

* *Pueraria thunbergiana.*

to physiological effects they are stimulants. Alcohol chemically destroys bee venom and the reverse. Because the alcoholics resort to alcoholic liquor for the stimulating effect it stands to reason that beekeepers being often stung by bees and being thus stimulated they do not need the stimulating effect of alcohol. That is the reason beekeepers, as a rule, are water drinkers. Dr. Bodog F. Beck. (*Indian Bee Journal*, March and April 1941)

Honey as Baby Food. A neighbour of mine had a baby girl, perfectly normal in every way at birth, but who lost weight and cried continuously because of hunger. The mother could not feed her, and no commercial preparation seemed to agree with her, cow's milk included. At six weeks of age she weighed less than at birth.

I was worried, as I had been with the mother when the baby was born, and I was sure she would lose it, if something were not done soon. I took her some of our honey, and asked her to try a teaspoonful of it in a bottle of cow's milk instead of sugar.

It was miraculous. The baby took it greedily, did not vomit, and slept several hours. From then on she began to gain. She is now three years old and the picture of Health. Mrs. Howard C. Coale. (*The Indian Bee Journal.* March and April 41.)

Soil Conservation. Control of soil erosion is being placed on a thoroughly scientific basis for the first time in the world's history, was pointed out by Dr. Hugh Bennet, chief of the U. S. Soil Conservation Service, in an address given at the meeting of the American Association for the Advancement of Science. The ancient world developed some remarkable engineering works designed to stabilize hill side soil, but not until the American soil conservation program got under way, was there a convergence of such a diverse array of knowledge and skill as now puts up a defensive battle against erosion. Any given project will call for the services of crop experts, engineers, foresters and possibly other types of scientific workers. Before actual work is started on a farm or group of farms, a thorough survey is made. Each field is classified according to soil type, slope, extent of erosion and land use. Maps based on such surveys guide farmers in the more advantageous and economic use of their land. Already 90 million acres have been thus surveyed. Particular attention has been given to the problem of producing crop without constantly turning the soil over and thus exposing it to accelerated erosion. The Soil Conservation Service has developed a technique known as "stubble mulching." Crop residues are left on the surface while the soil underneath is ploughed with a subsoil tiller. The residues thus provide surface protection which checks runoff by keeping the surface soil in such condition that nearly all the water soaks into the ground. This reduces evaporation from the surface and helps protect the land against both wind and water erosion. (*Science* Vol. 94; No. 2429, Suppl, July 1941.)

Correspondence.

To

The Editor, The Madras Agricultural Journal.

Sir,

Measurements of an extraordinary Indian bee colony. In August 1940 a colony of the Indian bee *(Apis indica)* of unusual size was observed attached to the ceiling of a house in Muddapura village of Tadepallegudem Taluk. The age of the colony was about 9 to 10 months. In September 1940, the colony was hived in a standard Newton hive. Only a single queen was found in the colony. Before hiving rough measurements were taken of the combs. The colony

measured 15″×9″×8″ and the total surface area of the combs was 1433·3 sq. in. The largest comb measured 18″×9″.

At the time of hiving 8 lb. of honey was obtained. The hived colony was shifted to Vundrajavaram village and it gave about 28 lb. of honey from February to October 1941. The colony is now in good working condition.

In a communication to the *Indian Bee Journal* (Vol. III Nos. 5 and 6) by D. N. Vaishnava, measurements of 2 or 3 such colonies are given. One of these measured 18″×8″×12″ the largest comb in it measuring 19½″×7″ (combs were occupying curved positions). Another one measured 17″×8″×12″ with 13 combs of varying sizes the largest one being 12″×7½″.

Kovur
4—9—41

Yours etc.,
A. Sankaram.

We understand that the Government Entomologist, Coimbatore, has come across such big sized colonies on three occasions. (Editor).

Crop and Trade Reports.

Statistics—Paddy—1941-42—Second forecast Report. The average of the areas under Paddy in the Madras Province during the five years ending 1939-40 has represented 13·1 per cent of the total area under paddy in India.

The area sown with paddy upto 25th November 1941 is estimated at 8,737,000 acres. When compared with the area of 8,928,000 acres estimated for the corresponding period of the previous year, it reveals a decrease of 2·1 per cent.

The area is the same as that of last year in Bellary, Anantapur and the Nilgiris. An increase in area is revealed in Guntur, the Carnatic, Coimbatore, Trichinopoly and the South and a decrease in area in the other districts of the Province. The variations are marked in Vizagapatam (−130,000 acres), East Godavari (−70,000 acres), West Godavari (−90,000 acres), Chingleput (Plus 60,000 acres), Salem (−45,000 acres), Trichinopoly (plus 45,000 acres) and Tinnevelly (plus 60,000 acres).

The first crop of paddy has been generally harvested throughout the Province. The yield per acre is expected to be normal in Guntur, Bellary, Anantapur, Nellore, Chingleput, Salem, Madura, Ramnad, Tinnevelly, Malabar and South Kanara and below normal in the other districts of the Province due generally to insufficient rains. Paddy under tanks in the upland taluks of West Godavari and Kistna, samba paddy in Chingleput, and paddy in Salem and Tanjore are reported to have been affected to some extent by insect pests.

The seasonal factor for the province as a whole works out to 97 per cent of the average as against 99 per cent in the corresponding period of the previous year.

The wholesale prices of paddy, second sort, per imperial maund of 82 2/7 lb. (equivalent to 3,200 tolas) as reported from important markets on 8th December 1941 was Rs. 4—1—0 in Chittoor, Rs. 4—0—0 in Vellore and Madura, Rs. 3—14—0 in Masulipatam, Rs. 3-13-0 in Bezwada and Guntur, Rs. 3-12-0 in Rajamundry, Ellore and Anantapur, Rs. 3-10-0 in Vizianagaram, Cocanada, Hindupur, Virudunagar and Tinnevelly, Rs. 3—8—0 in Trichinopoly, Rs. 3—4—0 in Conjeevaram, Rs 3-3-0 in Kumbakonam, Rs. 3-2-0 in Negapatam, and Rs. 2-15-0 in Cuddalore. When compared with the prices published in the last report, i. e., those which prevailed on 3rd November 1941, the prices reveal a rise of 20 per cent in Anantapur, 16 per cent in Hindupur, 11 per cent in Rajahmundry, ten per cent in Vellore, nine per cent in Bezwada, Guntur and Cuddalore, eight per cent in Chittoor, seven per cent in Ellore and Masulipatam, six per cent in Conjeevaram, five per

cent in Madura, four per cent in Cocanada, and two per cent in Kumbakonam and a fall of about seven per cent in Negapatam and three per cent in Virudunagar, the prices remaining stationary at Vizianagaram, Trichinopoly and Tinnevelly.

Statistics—Crop—Sugarcane—1941—Intermediate condition report. The condition of the sugarcane crop is generally satisfactory and the yield per acre is expected to be generally normal in all districts outside Vizagapatam, East Godavari, Kistna, Kurnool, Bellary and North Arcot. The canes are reported to have lodged in parts of North Arcot on account of the recent cyclone.

The wholesale price of jaggery per imperial maund of 82 2/7 lb. (equivalent to 3,200 tolas) as reported from important markets on 8th December 1941 was Rs. 5—14—0 in Trichinopoly, Rs. 5—11—0 in Vizagapatam, Rs. 4—15—0 in Rajahmundry and Adoni, Rs. 4—10—0 in Cocanada, Rs. 4—9—0 in Mangalore, Rs. 4—6—0 in Cuddalore and Vellore, Rs. 4—2-0 in Vizianagaram, and Chittoor, Rs. 3—9—0 in Coimbatore, Rs. 3—5—0 in Salem and Rs. 3—3—0 in Bellary: When compared with the prices published in the last report, i. e., those which prevailed on 3rd November 1941, these prices reveal a rise of approximately 34 per cent in Trichinopoly, 20 per cent in Rajahmundry, 14 per cent in Vizagapatam, 12 per cent in Cocanada, nine per cent in Vellore and four per cent in Coimbatore and a fall of approximately 17 per cent in Mangalore, the prices remaining stationary in Vizianagaram, Adoni, Bellary, Cuddalore, Salem and Chittoor. *(From the Director of Industries and Commerce, Madras).*

Cotton Raw, in the Madras Presidency. The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 5th December 1941 amount to 610,741 bales of 400 lb. lint as against an estimate of 503,500 bales of the total crop of 1940-41. The receipts in the corresponding period of the previous year were 498,728 bales. 568.262 bales, mainly of pressed cotton were received at spinning mills and 60,631 bales were exported by sea while 1,08,046 bales were imported by sea mainly from Karachi and Bombay.

(From the Director of Agriculture, Madras).

Mofussil News & Notes.

The Agricultural Exhibition held at Mayavaram in November 1941. An Agricultural Exhibition was held for 10 days from the 6th to 16th November 1941 at the bathing ghat of the river Cauvery at Mayavaram during the "Thula Cauvery Punyakalam bathing Festival". A large concourse of people from the different parts of the Tamil Nad, who came down to this place for the occasion, visited the exhibition stall. Daily attendance at the stall was more than 10,000. The exhibits and posters were arranged in groups or sections representing the different phases of the Departmental activities and these included paddy strains classified as *Kuruvai* and *Kar*, *Samba*, deep water and other special varieties both local and foreign strains of millets and oil seeds, timber and fruit plants recommended for the tract; a working colony of bees; implements and specimen crops of green manures, paddy nursery with reduced seed rate and other usual features. Special mention may be made of an arresting pictorial poster on preservation of cattle manure recently printed by the Department and a word poster written up for the occasion calling on the *mirasdars* to use freely the services of Department and to very materially increase the food production of the country to meet deficits which were met in normal times by imports from other countries. Laudable remarks and appreciation of the Departmental efforts were recorded by some of the visitors in the visitors' sheet opened for the purpose, and these included valuable suggestions and indents for implements, seeds and plants also. A large number of departmental publications, including a few priced ones, were distributed among the public. M. A.

Rural uplift work, by the Ryots' Association, Thotavada, Palakonda Taluk, Vizagapatam District. The Ryots' Association was started in 1940 November by the Deputy Director of Agriculture, Cocanada, and conducted rural uplift work from 27—11—1940 to 1—12—40. This year the Association organised rural uplift work from the 14th to the 18th November. Every day there were meetings, and the ryots were advised by the officers of the different Departments of Government as well as by the Medical and the Educational officers of the District Board on various subjects. The meetings were attended by members of the District Board and Panchayat Boards, and a large number of *ryots*.

The items of work consisted of laying improved roads, cleaning of villages and water sources, attending to the ailments of cattle, exhibitions of improvements recommended by the Agricultural, Veterinary, Public Health and Education Departments, with lantern lectures and entertainments of the visitors by *bhajanas* and dramas. Use of improved agricultural implements, bee keeping, spinning with charkhas mat making and rope making were also demonstrated. Fruits, trees and useful plants such as, *bodantam* (*Bauhinia purpurea*, Linn.) were planted in the *porambokes* and school gardens were started. B. P.

College and Estate News.

Students' Corner. Students' Club: There was a lecture by Rev. J. C. McGilvray, M. A. (Oxon) on "The background for the war news that we receive through various sources like the papers, radio, etc" on Monday, the 24th November. Sri A. Adivi Reddy, B. Sc. III occupied the chair. The lecture was most interesting as it revealed certain startling facts about the German preparation for world conquest. The members of the Students' Club had a lucky opportunity to listen to a most illuminating and exhilarating address by Sri. Rao Bahadur O. Kandaswami Chettiar, retired Professor of English of the Madras Christian College, on Monday, the 1st December on "Four things that an aspiring young man should possess". Sri. S. N. Chandrasekhara Ayyar, Lecturer in Botany and an old student of the Professor, presided. Rev. J. C. McGilvray again spoke to the members of the club on the 8th of December on "The British and Indian Universities". R. C. Broadfoot Esq., I. A. S., Principal of the College, Presided.

Cricket. In the match for the Rhondy shield played on 29—11—41, on our grounds, between the Agricultural College and the Government Arts College, Coimbatore, our College won by scoring 143 for 5. The opponents were all out for 128. A remarkable feature of the match was the brilliant batting of H. Shiva Rau, who scored 41, and C. Sankara Rao who remained unbeaten with 57.

Football. In the match for the Stone Trophy Tournament, played on the 25th November our College was defeated by the Government Arts College, Coimbatore, by 2 goals to nil.

Interclass tournaments for the Victory Cup:—

Cricket. 8—11—41 class III defeated class II.
Hockey. 27—11—41 class I defeated class II.
Football. 16—11—41 class II defeated class I (finals).

Inter-tutorial tournaments.

Cricket. 9-11-41. C. Narasimha Ayyangar's wards defeated P. V. Ramiah's wards.
15-11-41. C. M. John's wards defeated B. M. Lakshmipathi's wards.
16-11-41. C. R. Srinivasa Ayyangar's wards defeated C. Narasimha Ayyangar's wards.
22-11-41. K. M. Thomas's wards defeated C. M. John's wards.

Hockey. 9-11-41. B. M. Lakshmipathi's wards defeated C. R. Srinivasa Ayyangar's wards.

30-11-41. B. M. Lakshmipathi's wards defeated C. M. John's wards.

Football. 30-11-41. P. V. Ramiah's wards defeated C. R. Srinivasa Ayyangar's wards.

Association of Economic Biologists Dr. S. Ramanujam delivered a lecture on 'Self Sterility in Plants' on 21st November 1941, under the auspices of the association.

Ladies' Club. The Annual Club Day was celebrated on 6th December with great eclat. The premises of the club was tastefully decorated and a number of interesting items of sports were gone through. In the evening, there was an entertainment. Mrs. V. Ramanathan distributed the prizes.

Table Tennis tournaments. We are glad to learn that Sri. N. Muthuswami Naidu of the Entomology section has been chosen as one of the five to represent Madras in the Inter-Provincial Table Tennis tournaments to be held at Delhi this Christmas. We offer our hearty congratulation to Sri. N. M. Naidu, and wish him all success.

St. John Ambulance Brigade. Another Examination in First Aid was held on 17th November 1941 at which 28 students and two members of the staff of the Agricultural College and Research Institute appeared. Twenty seven came out successful. So far, 87 people from the college estate have secured the First Aid certificates.

University of Madras. The Maharaja of Travancore Curzon Endowment lectures—Agriculture—1942. Under the above endowment Dr. A. Subba Rao, M. A.. M. Sc., D. Sc., F. Inst. P., Soil Physicist, D. F. S. Bellary, delivered two lectures on "Soil erosion and conservation of moisture in the un-irrigated black soils," on the 18th and 19th December 1941, at the Agricultural College, Coimbatore.

Senate Elections. We understand that Sri. S. N. Chandrasekaran, Lecturer in Botany, Agricultural College and Research Institute, Coimbatore, intends standing as a candidate for election to the Senate of the University of Madras by the Registered Graduates, at the ensuing elections to the Senate. Mr. Sekhar has put in over twenty-two years of service as Lecturer in the Agricultural College and is eminently fitted to represent Agricultural education in the Senate. He has been taking keen interest in educational matters and has served in the Academic council during the years 1938 to 1940 as the unanimously elected representative of the teaching staff of the Agricultural College. We heartily commend his candidature for general acceptance and specially request the members of the Union and the readers of the Madras Agricultural Journal to give their first vote in his favour.

Departmental Notifications.

Gazetted Notifications.

Appointment.

Sri. C. R. Srinivasa Ayyangar, the senior-most Crop Specialist is appointed Paddy Specialist and Geneticist during the absence on leave of Sri. Rao Bahadur G. N. Rangaswami Ayyangar.

Sri. C. Vijayaraghavacharya, permanent Upper Subordinate, Science section and temporary Superintendent, Dry Farming Station, Hagari, on leave is recalled and appointed to officiate as Millets Specialist, Coimbatore, vice Sri. Rao Bahadur G. N. Rangaswami Ayyangar granted leave.

Postings.

Sri. M. U. Vellodi, District Agricultural Officer, on return from leave to be District Agricultural Officer, Coimbatore,

Sri. R. Swami Rao, District Agricultural Officer, on return from leave to be District Agricultural Officer, Guntur.

Sri. N. Subramania Ayyar, Officiating District Agricultural Officer, on relief by Sri. M. U. Vellodi, is posted as District Agricultural Officer, Sattur *vice* Sri. K. Avudainayagam Pillai, on leave.

Leave.

Sri. Rao Bahadur G. N. Rangaswami Ayyangar, Millets Specialist and Geneticist, Coimbatore, is granted l. a. p. for one month with effect from 12—12—1941 afternoon or date of relief.

Sri. V. T. Subbiah Mudaliar, D. A. O. extension of l. a. p. for 2 months from 3—1—42.

Sri. S. Sitharama Pathrudu, D. A. O. extension of l. a. p. for 1 month from 11—12-41.

Sri. R. Chockalingam Pillai, D. A. O., Salem, l. a. p. for 1 month and half average pay for 6 months from 10—1—42.

Sri. K. Avudainayagam Pillai, D. A. O., Sattur, l. a. p. for 4 months from date of relief.

Subordinate Service.

Appointments.

Syed Ibrahim Sahib is re-appointed as Upper Subordinate, Science Section and is posted to officiate as Assistant in Chemistry, Agricultural Research Station, Siruguppa.

Mohammed Zainulabdeen Sahib, Officiating Upper Subordinate, is re-appointed as Upper Subordinate in the Science section and is posted to officiate as Assistant in Paddy, Agricultural Research Station, Maruteru.

Transfers.

Name of Officers.	From	To
Sri. V. V. S. Varadarajan,	F. M., A. R. S., Guntur,	A. D., Ongole.
,, N. Ramadoss Pantulu,	A. D., Ongole,	F. M., A. R. S., Nandyal.
,, T. Paramanandam,	F. M., A. R. S., Nandyal,	F. M., A. R. S., Guntur.
,, K. M. Narayanan,	F. M., A. R. S., Nileshwar,	F. M., A. R. S., Nanjanad.
,, K. Jagannatha Rao,	D. A. O., Guntur,	A. D. Badvel.
,, V. Karunakaran Nayar,	F. M., Agri. Coll. Dairy, Coimbatore.	A. D., Sivaganga.
,, A. K. Annaswamy Ayyar,	A D., Sivaganga,	F. M. Central Farm, Coimbatore.
,, K. Brahmachari,	Temporary Asst. in Entomology A. R. S. Gudiyattam,	Asst. in Entomology, Coimbatore.
,, M. Narasimham,	A. D., Tenali,	F. M., A. R. S., Samalkota.

Leave.

Name of Officers.	Period of Leave.
Sri. S. Ramachandran, A. D. (on leave)	Extension of l. a. p. for 3 months from 5—11—41.
„ C. Ekambaram, F. M., S. R. S., Gudiyattam,	L. a, p, on m. c. for 35 days from 19—11—41,
„ A. Venkobachari, A. D., Harpanahalli,	Leave on half average pay on m. c. for 4 months from 5—11—41.
„ P. K. Kannan Nambiar, F. M. (on leave),	L. a. p. for 2 months from 28—11—41.
„ M. Satyanarayana, F. M., A. R. S., Samalkota,	L. a. p. for 3 months and 22 days from 2nd January 1942.
„ P. K. Natesa Iyer, A. D., Rasipuram,	L. a. p. for 6 weeks from 19—12—41.